REMARKS

The claims have been amended to more clearly define the invention. These minor amendments to the claim language are to more particularly point out the Applicant's invention. No new matter has been added as a result of the above amendments.

The Examiner further rejected the claims under 35 USC 103(a) as being obvious over Tankovich et al., (U.S. Pat. No. 6,050,990) in view of Ecknouse et al., (U.S. Pat. No 5,849,029). Tankovich applies laser light into skin to be treated to accomplish the removal of unwanted hair. The applicant's device uses multi-wavelength light as shown in Fig. 4A of the application. Laser light is single wavelength coherent light, which has a far different effect. When single wavelength laser light is applied to the graph as shown in Fig. 4A, a vertical line represents it. Since melanin absorption and depth penetration are inversely related, any single laser wavelength such as in Tankovich would have to sacrifice either depth penetration or melanin absorption since it cannot cover all wavelengths as with multi-wavelength light.

Tankovich additionally, teaches controlling photothermal damage to skin by selection of laser parameters and dynamic cooling of the skin surface or by applying a continuous spray of ice water or other coolant to the skin surface. (Tankovich, Col. 65, lines 37-53), The applicant's device has no dynamic cooling of the skin surface nor does it apply any form of cooling liquid or spray to the skin. The water coolant passes only through the lamp chambers, as shown in Figure 1 of the application. This coolant is used to remove the high temperature waste heat generated by the lamps, Fig. 1, **1,** reflective chamber Fig. 1, **5**, and the 610nm long pass filter, Fig. 1, **9**. The coolant does not pass near, nor effect the temperature of the skin. The light guide, in the applicant's device, is hollow and contains no coolant. Unlike Tankovich the applicant's device requires no cooling of the skin surface due to the unique characteristic of the pulse duration. The 18ms-pulse duration, as shown in Figure 3A, is longer than the 10ms thermal relaxation time of the skin and shorter than the average hair follicle thermal relaxation time of 40ms. By having the pulse duration longer than the skin's thermal relaxation time, the skin is allowed time to dissipate the heat to the surrounding tissue. This same pulse duration does not give the hair follicle enough time to dissipate the heat since the pulse duration is shorter than the time the follicle needs to conduct the heat away. By utilizing these physical attributes of skin and hair, the resulting effect

confines the heat to the hair follicle while allowing the skin to cool. Thus, unlike the teachings of Tankovich, no active cooling system is required.

The Examiner states that Tankovich teaches the hair may be shaved before treatment. (Tankovich, Col. 65, lines 4-8) While Tankovich does teach the shaving of hair before treatment the reasons advanced within the teachings of Tankovich is only to assess the hair growth cycle of the patient. This is done by counting the hairs one to eight weeks after shaving to judge the number of hairs in the anagen phase.

The applicant's device requires the hair to be shaven prior to treatment but for much different reasons than the teachings of Tankovich. The shaving of the hair within the applicant's invention is done for the following reason. Any hair above the skin will absorb and block the light from penetrating through the skin to the follicle. Since it is the hair follicle that is the desired target, any hair above the skin renders the device less efficient.

The examiner further objects in that Tankovich teaches a hollow reflective light guide placed against skin surface, forming optical seal wherein light guide has aperture which incident light passes. However, unlike the applicant's invention, Tankovich's light guide is used to recycle photons from an incoming laser beam, which are reflected from the skin surface. The laser beam enters a hole in the reflective dome and hits the skin. Tankovich's device reflects the portion of a laser beam that is reflected by the skin, back to the skin, and thus reusing the otherwise wasted reflected light for increased efficiency. This reflective light dome is completely different from principle utilized within the applicant's invention.

The applicant's device utilizes a light guide as a conduit for the light generated by the lamps and unlike Tankovich does not use a collimated laser beam that can travel through air. The multi-wavelength length generated by the lamps is scattered in all directions. Since the light is scattered and not collimated like a laser, the only way to transfer the light is by way of a light tube or optical fiber. Since the area is too large for an optical fiber, a hollow reflective light guide is used for the transference of the light. This is a light guide used as a conduit for the light generated by the lamps, while Tankovich uses a reflective dome to capture laser light loss reflected from the skin.

The Examiner further objects in that Tankovich teaches a transparent contact-window placed atop skin surface. Tankovich teaches that many materials can be used for this window and thus it is known in the art that a filter can be used to transmit selected wavelengths.

Tankovich uses a contact window "...for reducing light loss by scattering and reflection at a skin surface during skin lasing techniques." (Tankovich et al. Col 53, lines 6-8). The materials are listed, Table 5, to show materials that have an index of refraction greater or equal to that of skin to reduce attenuation loss of the laser beam.

The applicant's invention does not have a contact window. The hollow reflective light guide rests on the skin and contains only air. Since the light of the applicant's device is multi-wavelength and non-collimated, index of refraction does not apply. The light generated by the device is innately scattered at all angles, so any contact window would provide only a degree of light loss.

The 610nm filter is not used as a contact window. It serves two purposes. The first is to block out wavelengths below 610nm and convert them to heat. This is to create the specific intensity wavelength distribution pattern as shown in Fig. 4A. The second purpose of the filter is to seal out the lamp cooling water, Fig 2, from entering into the hollow reflective light guide shown in Fig. 2. Having the filter encased with the lamp housing allows the lamp cooling system to also remove the heat generated by the filters light blocking action.

If this filter was used as a contact window, an active cooling system would be needed such as described in Eckhouse et al. Patent 5,849,029. Although Eckhouse teaches a radiation source of broad spectrum, a radiation source wavelength pattern completely changes the clinical effect of photothermolysis. The radiation source of the application device is claiming a particular wavelength distribution pattern. This pattern generated by the application device cannot be simply defined as broad-spectrum radiation. It is a specific radiation pattern that produces a specific effect. Further the applicant's invention utilizes multiple flashlamps. This plurality of lamps allows simultaneous firing to allow incredibly high bursts of energy that would normally explode a single lamp system. Also, the water cooling lamp system described in the applicant's device, unlike Eckhouse, allows energies to be delivered up to 10 times the amount of any air cooled lamp device.

The application device has a reflector, which can be compared to Eckhouse. However, this basic comparison can be made to any light source such as home lighting, headlights and even flashlights.

Eckhouse uses an optical fiber or solid quartz material for a light guide (Eckhouse Col. 5, lines 46-49). The Eckhouse device is a series of glass base solids used for light transfer, filtering,

and a window all fused together with a heat exchanging system connected to the bundle to remove the heat generated from losses in each glass based substance and the skin.

The applicant's invention does not use such a method. The light guide is a hollow tube of reflective gold. It uses no window, no solid quartz light guide or optical fiber and no heat exchanger to remove heat from the skin or light guide, unlike the teachings of Eckhouse. The liquid cooling in the applicant's invention is not connected to or used to remove heat from the hollow light guide or the skin, it is used for high power flashlamp cooling. Both Eckhouse and the applicant's invention do have a filter; however, they are used very differently. The applicant's invention contains the filter in the liquid cooled lamp assembly for high power production of the wavelength pattern output shown in Fig. 4A. Eckhouse utilizes the filter in a bundled system of solid glass light guide, window and thermal conducting cooling system, which is a contact delivery device pressed against the skin. (Fig. 2).

The examiner further finds obviousness in light of Fullmer et al. As follows:

The examiner objects to claim 5 in light of Fullmer Col. 7 lines 49-53 that teaches that the pulse width can be adjusted between 10 and 1000ms to match the thermal relaxation time of the target.

The Fullmer invention utilizes a single low energy pulse system whose pulse width can be adjusted from 10 to 1000ms. The applicant's invention utilizes a four pulse sequence where each pulse is at a fixed 18ms duration with the ability to fire all lamps simultaneously or adjusting the time duration in which the four pulse train fires as described in Fig. 3C, 3D. Each individual pulse is at a fixed 18ms duration solely for the purpose of exceeding the thermal relaxation time of the skin to prevent damage.

Claim 6 is objected to in light of Fullmer. Fullmer teaches that an electrical input to the filament lamp of 40 - 195 J is supplied to the filament lamp with a measured output of .531 - 3.91 joules for the device.

The Fullmer device utilizes an extremely low power filament lamp to produce an output up to 3.91 joules when 195 joules of electrical energy is supplied to the filament lamp. The applicant's invention is an extremely powerful device capable of 75 joules/cm^2. The device has an output area of 4cm^2 and a total output of 300 joules per pulse train as compared to the Fullmer device of 3.91 joules. It has a magnitude of almost 100 times the output energy and has no real similarity to Fullmer.

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Objection is made to claim 2, 3, and 10 in light of Fullmer. Fullmer teaches that a filter can be configured to allow a light spectrum between 700nm and 1um and the Examiner states that it would be obvious to modify Tankovich's invention in view of Eckhouse and Fullmer and use a Broader range of light spectra in order to have a pulse geometry which is effective on a broad range of hair follicle.

The fact that the application device has an increased range of wavelengths (610nm to 1100nm) over that of Fullmer (700nm to 1000nm) has no effect on the pulse geometry. The pulse geometry is the shape of the discharge energy pulse of the light and has no correlation with the wavelength. The application invention has a wider range of wavelength output than that of Fullmer. The increased range is located at both ends of the spectrum from 610nm to 700nm and from 1000nm to 1100nm. This is a large benefit over the Fullmer device since the melanin absorption is double at 610nm as compared to 700nm. This provides greater efficiency of photothermolysis of the hair. The increased wavelength range from 1000nm to 1100nm also has a depth penetration benefit as seen in Fig. 4B. This will allow more effective photothermolysis on deeper hair follicles.

The unique pulse geometry of the application device, Fig. 3A, is effective on a broad range of hair follicle sizes by taking advantage of thermal relaxation time. The overall pulse duration, Fig 3A, is set at 18 ms. This duration is greater than the thermal relaxation time of the skin, which is 10ms and allows the skin time to cool. The pulse geometry, places the majority of the energy in the 1st half of the pulse duration, as shown in Fig 3A, while the second half of the pulse duration, carries approximately 30% of the total pulse energy. By manipulating this pulse geometry, it allows small size hair follicles (with thermal relaxation times as low as 15ms) to reach higher temperatures since most of the energy is delivered in the first 9 ms.

PETITION FOR EXTENSION OF TIME

The applicant has attached to this response a petition for extension of time along with the corresponding fee due and respectfully request that said petition is allowed.

CONCLUSION

By the amendments and all the reasons advanced above, Applicant respectfully submits that the application is in condition for allowance. Therefore, reconsideration and allowance are respectfully requested.

The Examiner is invited and encouraged to telephone the undersigned with any concerns in furtherance of the prosecution of the present application

Respectfully submitted,

John C. Serio
Attorney for the Applicant
Reg No. 39,238
1299 Masssachusetts Ave
Lexington, Massachusetts
781-862-1448

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